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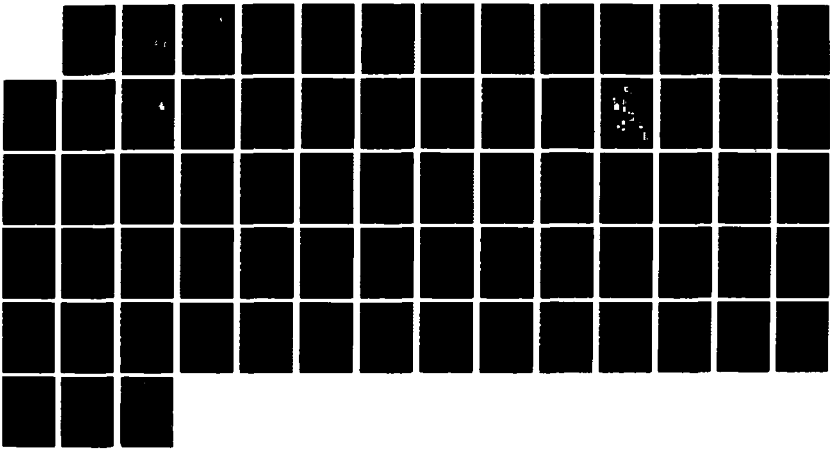

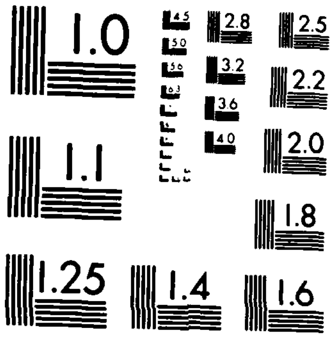

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INSTALLATION RESTORATION PROGRAM

Preliminary Assessment
Records Search

181st Tactical Fighter Group
Indiana Air National Guard
Hulman Field
Terre Haute, Indiana

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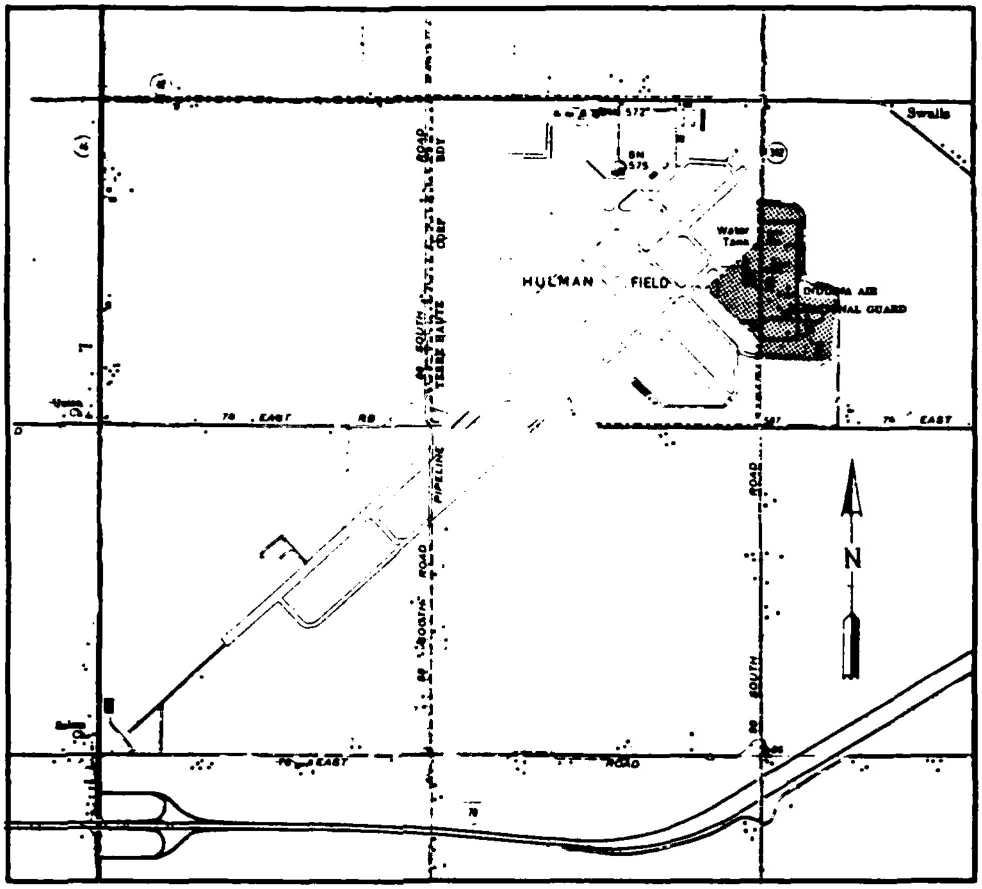

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INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT - RECORDS SEARCH FOR

181st TACTICAL FIGHTER GROUP
INDIANA AIR NATIONAL GUARD
HULMAN FIELD
TERRE HAUTE, INDIANA

September 1987

Prepared for

National Guard Bureau
Andrews Air Force Base, Maryland 20331-6008

Prepared by

Hazardous Materials Technical Center
The Dynamac Building
11140 Rockville Pike
Rockville, Maryland 20852

Contract No. DLA 900-82-C-4426

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EXECUTIVE SUMMARY

A. INTRODUCTION

The Hazardous Materials Technical Center (HMTC) was retained in March 1986 to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) - Records Search of the 181st Tactical Fighter Group (TFG), Indiana Air National Guard, Hulman Field, Terre Haute, Indiana (hereinafter referred to as the Base)~~, under Contract No. DLA 900-82-C-4426 (Records Search)~~. The Records Search included:

- an onsite visit including interviews with 17 Base employees conducted by HMTC personnel during 19-21 March 1986;
- the acquisition and analysis of pertinent information and records on hazardous materials use and hazardous waste generation and disposal at the Base;
- the acquisition and analysis of available geologic, hydrologic, meteorologic, and environmental data from pertinent Federal, State and local agencies; and
- the identification of sites on the Base which may be potentially contaminated with hazardous materials/hazardous wastes (HM/HW).

B. MAJOR FINDINGS

Past Base operations involved the use and disposal of materials and wastes that subsequently were categorized as hazardous. The major operations of the 181st TFG that have used and disposed of these materials and wastes are aircraft maintenance and ground vehicle maintenance. Waste oils, recovered fuels, corrosion inhibitors, spent cleaners, strippers, and solvents were generated and disposed of by these activities.

Interviews with 17 Base personnel and a field survey resulted in the identification of six disposal and/or spill sites at the Base. The sites that are potentially contaminated with HM/HW have been further evaluated and given a Hazard Assessment Score (HAS) using the U.S. Air Force Hazard Assessment Rating Methodology (HARM):

Site No. 1 - Power Suppressor Pad (HAS-57)

Approximately 250 gallons of waste oil, JP-4, hydraulic fluid, detergents, and solvents leaked from an underground waste oil storage tank. Absorbent material was placed along sewer inlets and drainage ditch, but recovery was minimal.

Site No. 2 - Petroleum, Oil, and Lubricant (POL) Fill Stand (HAS-57)

An error in fuel deliveries resulted in overflowing a JP-4 storage tank. Approximately 400 gallons of JP-4 spilled and spread across a paved lot onto a grassy area. Discharge pathways were blocked and approximately 100 gallons of JP-4 were recovered. Additional small spills of JP-4 have also occurred.

Site No. 3 - Base Supply Warehouse (Unscored)

In 1980, a gasoline leak occurred on the west side of Building No. 3. The leak was contained almost immediately, and the affected pavement area and underlying soil were removed. Because subsequent soil samples collected in the area showed no contamination, this site was not scored under HARM and no further IRP work recommended.

Site No. 4 - Old Bladder Area (HAS-53)

This site consists of a diked grassy area, which was used during the 1960s to enclose five 50,000-gallon JP-4 storage bladders. These bladders were removed in 1967 or 1968. In 1978, 10,000 gallons of mixed JP-4 and water were pumped from a nearby underground storage tank into the diked area at the Old Bladder Area. The mixture remained at the site for 48-hours, when the floating JP-4, approximately 7,500 gallons, was skimmed off by a contractor. Assuming 90 percent of the JP-4 was recovered, approximately 750 gallons may remain at the site.

Site No. 5 - Vehicle Maintenance Building (HAS-60)

Prior to 1975, various amounts of waste oils, paint thinners, and solvents were occasionally dumped in the area adjacent to the maintenance building. The materials disposed of were usually less than 1 quart and were used during routine maintenance and clean-up. The total quantity of material disposed of in this matter is estimated to be less than 1,000 gallons.

Site No. 6 - Hangar, Building No. 1 (Unscored)

This site, located adjacent to the aircraft parking apron, was used until 1980 to store most of the hazardous wastes generated by the Base. These wastes were then collected by a local

contractor. Because no HM/HW spills were reported in this area and the site inspection revealed no environmental stress, this site was not scored under HARM and no further work recommended.

C. CONCLUSIONS

Four of the identified sites are potentially contaminated with HM/HW, and were scored using HARM. Shallow groundwater in the glacial till beneath the Base is susceptible to contamination from the surface and migration of contaminants is possible. Lower sandstone aquifers are believed to be protected from surface contamination by intervening shales of low permeability.

D. RECOMMENDATIONS

Because of the potential for contamination of shallow groundwater and subsequent contaminant migration, initial investigative stages of an IRP SI/RI/FS are recommended for the four sites that are potentially contaminated with HM/HW. The primary purposes of the subsequent investigations are:

1. To determine whether pollutants are or are not present at each site, and

2. To determine whether groundwater at each site has been contaminated by the identified sites, and if so, to quantify the contaminant concentrations and the rate and direction of contaminant migration, and identify the boundaries of the contaminant plume and proximity to possible receptors.

I. INTRODUCTION

A. BACKGROUND

The 181st Tactical Fighter Group (TFG) of the Indiana Air National Guard is located at Hulman Field, Terre Haute, Indiana (hereinafter referred to as the Base). Hulman Field has been used by the Air National Guard (ANG) since 1954. Over the years, the types of military aircraft based and serviced here have varied with the changing missions of the 181st TFG. Past Base operations involved the use and disposal of materials and wastes that subsequently were categorized as hazardous. Consequently, the National Guard Bureau has implemented its Installation Restoration Program (IRP). The IRP consists of the following:

Preliminary Assessment (PA) - Records Search to identify and prioritize past disposal sites posing a potential and/or actual hazard to public health or the environment.

Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS) - to acquire data via field studies for the confirmation and quantification of environmental contamination that may have an adverse impact on public health or the environment; and to prepare a Remedial Action Plan (RAP).

Research, Development, and Demonstration (RD&D) - if needed, to develop new technology for accomplishment of remediation.

Remedial Design/Remedial Action (RD/RA) - to implement site remedial action.

B. PURPOSE

The purpose of this PA - Records Search (hereinafter referred to as Records

Search) is to identify and evaluate suspected problems associated with past hazardous materials/hazardous waste (HM/HW) handling procedures, disposal sites, and spill sites on the Base. The Hazardous Materials Technical Center (HMTC) visited the Base, reviewed existing environmental information, analyzed Base records concerning the use and generation of HM/HW, conducted interviews with past and present Base personnel who are familiar with past HM/HW management activities, and made a physical inspection of the suspected sites. Relevant information collected and analyzed as a part of the Records Search included the history of the Base, with special emphasis on the history of the shop operations and their past HM/HW procedures; local geological, hydrological, and meteorological conditions that could affect migration of contaminants; local land use, public utilities, and zoning requirements that affect the potentiality for exposure to contaminants; and the ecological settings that indicate environmentally sensitive habitats or evidence of environmental stress.

C. SCOPE

The scope of this Records Search is limited to spills, leaks, or disposal procedures that occurred on Base property or on property used solely by the Base in the past, and includes:

- An onsite visit;
- The acquisition of pertinent information and records on hazardous materials use and hazardous wastes generation and disposal practices at the Base;
- The acquisition of available geologic, hydrologic, meteorologic, land use and zoning, critical habitat, and utility data from various Federal, Indiana State, and local agencies;
- A review and analysis of all information obtained; and
- The preparation of a report, to include recommendations for further IRP actions.

The onsite visit, interviews with past and present personnel, and meetings with Federal, State, and local agency personnel were conducted during the period 19-21 March 1986. The HMTC Records Search effort was conducted by Mr. Timo-

thy Gardner, Environmental Scientist (M.A., Environmental Biology, 1984), Mr. Robert J. Paquette, Environmental Scientist (B.S., Environmental Science, 1973), Ms. Janet Emry, Hydrogeologist (M.S., Geology, 1987), Mr. Mark D. Johnson, Geologist (B.S., Geology, 1980), and Mr. Raymond G. Clark, Jr., Program Manager (B.S., Mechanical Engineering, 1949) (resumes are included in Appendix A). Individuals from the ANG who assisted in the Records Search included: Mr. Arthur Lee, Environmental Engineer, ANGSC/DEV; Lt. Colonel Michael Washeleski, Bioenvironmental Engineer, ANGSC/DEV; and selected members of the 181st TFG. The Point of Contact (POC) at the 181st TFG was Capt. Michael P. McGowen, Base Civil Engineer.

D. METHODOLOGY

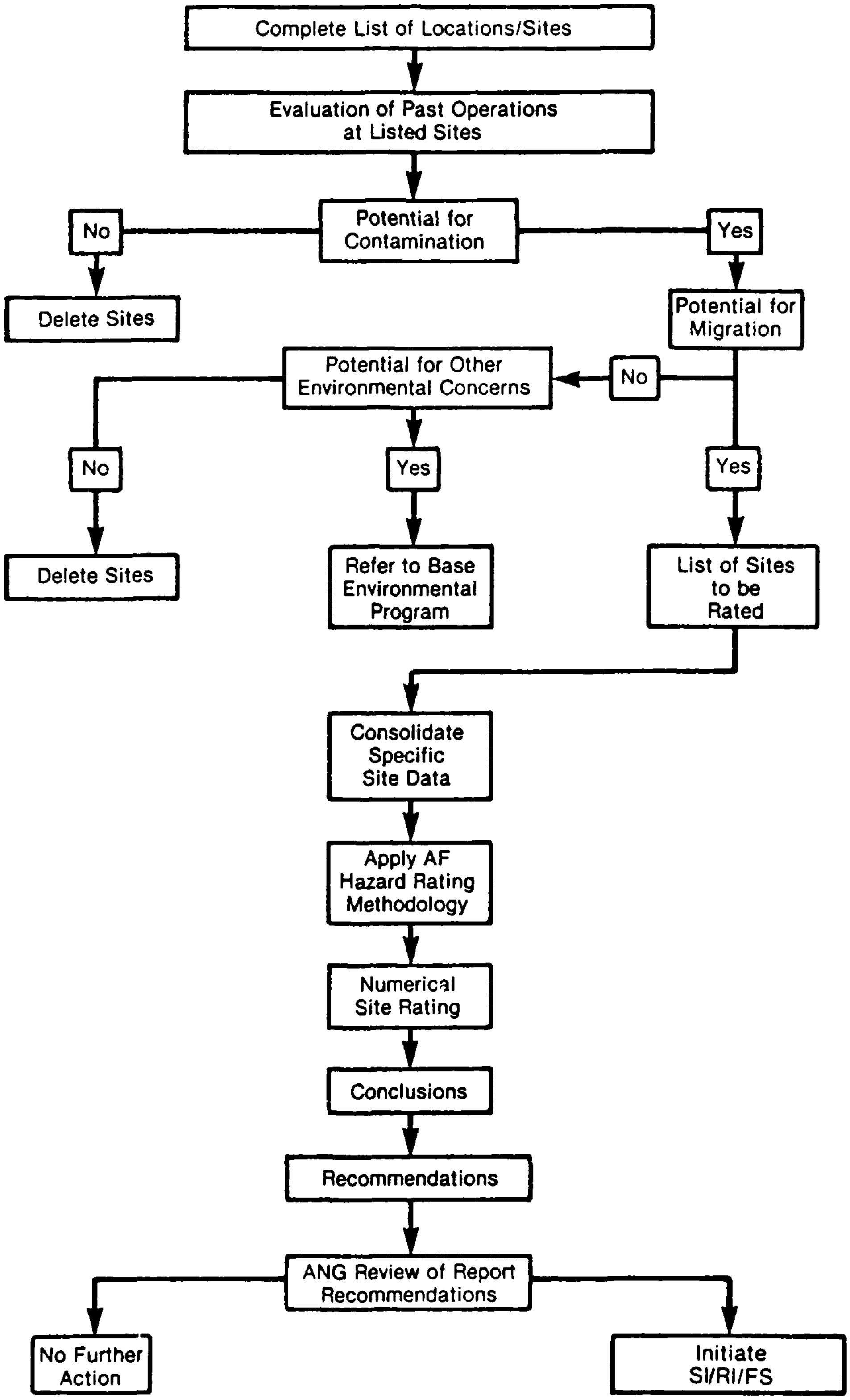
A flow chart of the Records Search Methodology is presented in Figure 1. This Records Search Methodology ensures a comprehensive collection and review of pertinent site-specific information, and is utilized in the identification and assessment of potentially contaminated hazardous waste spill/disposal sites.

The Records Search began with a site visit to the Base to identify all shop operations or activities on the installation that may have utilized hazardous material or generated hazardous waste. Next, an evaluation of past and present HM/HW handling procedures at the identified locations was made to determine whether environmental contamination may have occurred. The evaluation of past HM/HW handling practices was facilitated by extensive interviews with 17 past and present employees familiar with the various operating procedures at the Base. These interviews also defined areas on the Base where any waste materials, either intentionally or inadvertently, may have been used, spilled, stored, disposed of, or released into the environment.

Appendix B lists the interviewees principle areas of knowledge and their years of experience with the Base. Historic records contained in the Base's files were collected and reviewed to supplement the information obtained from interviews. Using the information outlined above, a list of past waste spill/disposal sites on the Base were identified for further evaluation. A general survey tour of the identified spill/disposal sites, the Base, and the surround-

Figure 1.
Records Search Methodology Flow Chart.

DECISION TREE



ing area conducted to determine the presence of visible contamination and to help the HMTC survey team assess the potential for contaminant migration. Particular attention was given to locating nearby drainage ditches, surface water bodies, residences, and wells.

Detailed geological, hydrological, meteorological, development (land use and zoning), and environmental data for the area of study was also obtained from the POC or from appropriate Federal, Indiana State and local agencies (Appendix C). Following a detailed analysis of all the information obtained, it was determined that three of the six identified sites are potentially contaminated with HM/HW and the potential for groundwater contamination exists. These sites were assigned a Hazard Assessment Score (HAS) according to the U.S. Air Force Hazardous Assessment Rating Methodology (HARM). Recommendations for follow-up investigations at the three potentially contaminated sites were developed.

II. INSTALLATION DESCRIPTION

A. LOCATION

The 181st TFG is located at Hulman Field, approximately 3 miles east of the city of Terre Haute, in Vigo County, Indiana.

The Base, which is situated 585 feet above sea level, consists of approximately 57 acres designated for exclusive use by the ANG. The runways are used jointly with the airport. Figure 2 shows the Base property studied for this Records Search.

B. ORGANIZATION AND HISTORY

The history of the 181st Tactical Fighter Group of the Indiana Air National Guard dates back more than half a century. In 1921, after persistent efforts, Wilbur F. Fagley received authority to organize Headquarter Battery, 82nd Field Artillery, in Kokomo, Indiana. Fagley envisioned an air squadron in the National Guard.

In 1922, the unit was redesignated the 137th Observation Squadron and then almost immediately was changed to the 113th Observation Squadron. Currently, the 113th Tactical Fighter Squadron (TFS) is part of the 181st Tactical Fighter Group (TFG). During 1926, the unit was moved to Schoen Field in Indianapolis, later to Scout Field in Indianapolis, and then in 1954 to its present location at Terre Haute's Hulman Field.

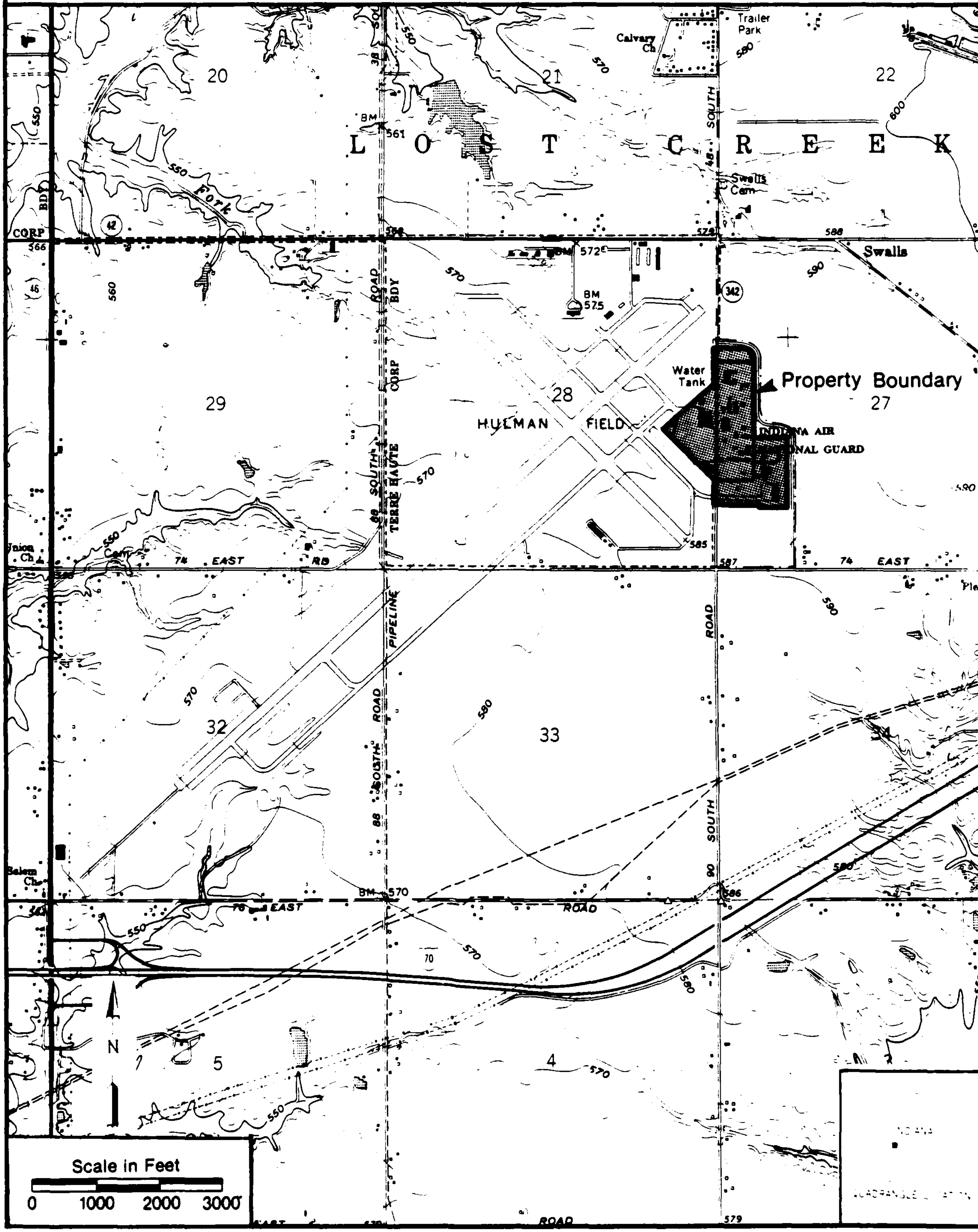
The unit served in World War II and flew submarine patrol along the east coast and Gulf of Mexico. The unit again was activated for the Korean conflict and Berlin Crisis. It also has been utilized many times during State emergency for floods and other disasters.

During the period 1946 to 1979, the 113th flew the following aircraft: the P-51D/F-51D, from December 1946 to July 1955; the F-80C, from August 1955 to February 1956; the F-86A, from March 1956 to 1958; the F84F, from April 1958 to

Source: USGS 7½ minute Quadrangle, Seelyville, Indiana 1963 (PREV. 1980).

HMTC

Site Map of Indiana Air National Guard Hulman Field, Terre Haute, Indiana



September 1962; the RF-84F, from October 1962 to April 1964; the F84-F, from May 1964 to August 1971; and the F-100D, from September 1971 to November 1979. The unit converted from the F-100 to the presently used F-4C Phantom during the period July through September 1979.

III. ENVIRONMENTAL SETTING

A. METEOROLOGY

The climate of Vigo County, Indiana, is midcontinental, influenced alternately by polar and tropical air masses. Average maximum temperature in the summer is 86° F and average minimum temperature in the winter is 17° F. Precipitation averages 39.12 inches annually. By calculating net precipitation according to the method outlined in the Federal Register (47 FR 31224, July 16, 1982), a net precipitation value of minus 6.12 inches per year is obtained. Rainfall intensity, based on 1 year, 24-hour rainfall, is 2.65 inches (calculated according to 47 FR 31235, July 16, 1982, Figure 8).

B. GEOLOGY

Hulman Field is located within the Wabash Lowland physiographic region of the Great Plains. The Wabash Lowlands are characterized by wide, level valleys and terraces, and broad, flat uplands that are dissected by steep drainageways. The uplands in the vicinity of the Base are formed of unconsolidated glacial till, which was deposited directly by ice. The till is predominantly a mixture of pebbles, sand, silt, and clay, with some small bodies of sand and gravel. Blanketing the uplands is a 5 to 15 foot thick layer of windblown silt (loess). (Hartke and others, 1983)

Immediately underlying the glacial sediments at the Base is the Petersburg Formation, which is Pennsylvanian in age and consists of up to 120 feet of southwesterly-dipping, interbedded sandstones, shales, and a few small coal seams. Below the Petersburg Formation is a thick series of southwesterly-dipping sedimentary rocks, increasing in age downward to the Cambrian System. Precambrian granitic basement occurs at a depth of about 8,000 feet (Hartke and others, 1983).

According to the U.S. Soil Conservation Service, the soils at the Base are classified as the Reesville silt loam. This soil was formed from loess on broad, flat uplands. The surface layer of the Reesville soil consists of gray-

ish-brown silt loam about 10 inches thick. The subsoil is a mottled, firm, silty clay loam, 20 inches thick, underlain by 12 inches of friable silt loam. The underlying material is yellowish-brown silt loam that grades to silt and is mottled with gray. Permeability of the Reesville soil is slow (4.2×10^{-5} cm/sec to 1.4×10^{-4} cm/sec) and the hazard of water erosion is low.

C. HYDROLOGY

1. Surface Water

According to the Federal Emergency Management Agency, the Base is not within a 100-year flood plain. Due to the low topographic relief, drainage is poorly developed in the areas surrounding the Base. Surface waters from the Base eventually find their way into Wabash River via small runs and branches, drainage ditches, and small tributaries. The surface water flow direction is generally to the southwest towards the Wabash River.

2. Groundwater

Water supplies in Vigo County come almost exclusively from groundwater, although the city of Terre Haute also draws water from the Wabash River. Groundwater sources include both the unconsolidated glacial sediments and the underlying consolidated bedrock. The "major unconsolidated aquifer" consists of valley-train outwash sand and gravel along the Wabash River. This aquifer is confined in some areas and unconfined in others. Wells drilled in the confined area of the major unconsolidated aquifer yield an average of 25 gpm. Wells in the unconfined area yield an average of 660 gpm and are suitable for large municiple supplies. Groundwater is also available in similar sand and gravel deposits in the valleys of the Wabash River tributaries. Groundwater also occurs in the upland glacial till in lenses of sand and gravel. Since these lenses are of limited thickness and areal extent, they can support only limited production (Cable and others, 1971; Hartke and others, 1983).

Potable groundwater is also obtained from bedrock in much of Vigo County, including the Base. Wells in the bedrock are developed primarily in the thick-

er, more extensive sandstone units, such as the lower portion of the Petersburg Formation. Shale units above and below the sandstone aquifers are sufficiently impermeable to confine the recharge to the sandstone and protect it from surface contamination. In some places, shale and coal may produce satisfactory supplies of groundwater; yields from these wells are low, but are adequate for farm, domestic, and small industrial suppliers (Hartke and others, 1983).

Groundwater in the unconsolidated glacial till beneath the Base occurs from 10 to 20 feet beneath the ground surface. Shallow groundwater flow is generally to the west or southwest, towards the Wabash River, which is 6.7 miles from the Base (Hartke and others, 1983). Based on the low hydraulic gradient (20 feet per mile) and the low permeability of the soils (1.4×10^{-4} cm/sec to 4.2×10^{-5} cm/sec), the flow rate of shallow groundwater beneath the Base is estimated to be from 2 to 7 inches per year (Fetter, 1980).

D. CRITICAL HABITATS/ENDANGERED OR THREATENED SPECIES

According to the Indiana Department of Natural Resources, there are no endangered or threatened species of flora or fauna in the vicinity of the Base. Furthermore, there are no critical habitats, wetlands, or wilderness areas in the vicinity of the Base.

IV. SITE EVALUATION

A. ACTIVITY REVIEW

A review of Base records and interviews with Base personnel resulted in the identification of specific operations within each activity in which the majority of industrial chemicals are handled and hazardous wastes are generated. Table 1 summarizes the major operations associated with each activity, provides estimates of the quantities of waste currently being generated by these operations, and describes the past and present disposal practices for the wastes. Based on information gathered, any operation that is not listed in Table 1 has been determined to produce negligible quantities of wastes requiring ultimate disposal.

B. DISPOSAL/SPILL SITE IDENTIFICATION, EVALUATION, AND HAZARD ASSESSMENT

Interviews with 17 Base personnel (Appendix B) and subsequent site inspections resulted in the identification of 6 waste disposal/spill sites. Of these six sites, four are potentially contaminated with HM/HW with a potential for migration, and these should be further evaluated. These sites were scored using HARM (Appendix D). Figure 3 illustrates the locations of the six sites. Copies of the completed Hazardous Assessment Rating Forms are found in Appendix E. Table 2 summarizes the Hazard Assessment Scores (HAS) for each of the scored sites.

<u>Site No. 1 - Power Suppressor Pad</u> (HAS-57)

This site is located at the south end of Base property adjacent to the ANG taxiway. In January 1986, a leak occurred in a 500-gallon underground waste oil storage tank. The tank was full and contained waste oil, JP-4, hydraulic fluid, detergent, and solvent. Approximately 250 gallons of the waste material material leaked out before repairs could be made. Base personnel immediately placed absorbent pillows and booms along the sewer inlet and other drainage ditches. Some oil was recovered, but no reliable estimate of the volume of re-

Table 1. Hazardous Waste Disposal Summary: Indiana ANG, Hulman Field, Terre Haute, Indiana

Shop Name	Building No.	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gal./year)	Method of Treatment/Storage/Disposal 1950 1960 1970 1980 Present
AGE Shops	19, 1	Engine Oil	400	CNTR
		Hydraulic Oil	100	CNTR
		PD-680	250	CNTR
		Paint Stripper	10	CNTR
		Gasoline	20	CNTR
		Battery Acid	20	SEP
		JP-4	50	FTA/CNTR
Corrosion/ Maintenance Control	37	Solvents/Thinners	40	CNTR
		Paint Strippers	20	CNTR
		JP-4	100	FTA
		JP-4	200	AGE
Fuels System	22, 37	JP-4	800	AGE
			500	CNTR
Aircraft Maintenance	1, 98	Engine/Hydraulic Oils	500	CNTR
		PD-680	850	CNTR
		Cleaning Compounds	220	CNTR
		Paint Strippers	220	CNTR
		JP-4	300	AGE
		JP-4	500	FTA/CNTR

KEY:

CNTR: Disposed of by Contractor
FTA: Used in fire training exercises offsite
AGE: Reused at AGE Shops
SEP: Neutralized and drained to sanitary sewer

OWS: Oil water separator
<u>Oils</u>: Disposed of by Contractor
<u>Waste Water</u>: Drained to sanitary sewer

Table 1. Hazardous Waste Disposal Summary: Indiana ANG, Hulman Field, Terre Haute, Indiana (Continued)

Shop Name	Building No.	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gal./year)	Method of Treatment/Storage/Disposal 1950 1960 1970 1980 Present
Propulsion	25	Engine oil	100	CNTR
		Synthetic Oil	150	CNTR
		PD-680	100	CNTR
		JP-4	200	FTA
		JP-4	20	FTA
		JP-4	200	CNTR
Motor Pool/ Vehicle Maint.	6,4	Engine Oil	800	CNTR
		PD-680	400	CNTR
		Battery Acid	100	SEP
		Gasoline	40	CNTR
		JP-4	200	FTA
N.D.I. Lab.	25	Engine Oil	15	CNTR
		PD-680	20	CNTR
		Fixer	15	CNTR
		Developer	75	CNTR
		Starter	50	CNTR
		Penetrants	10	OWS
		Cutting Oils	10	OWS
		Magnetic Inspection Compounds	15	CNTR

KEY:

CNTR: Disposed of by Contractor
FTA: Used in fire training exercises offsite
AGE: Reused at AGE Shops
SEP: Neutralized and drained to sanitary sewer

OWS: Oil water separator
<u>Oils</u>: Disposed of by Contractor
<u>Waste Water</u>: Drained to sanitary sewer

Source:
Indiana Air National
Guard, Base Map, 1985.

Location of Sites at
Indiana Air National Guard, Hulman Field, Terre Haute, Indiana.

Figure 3.

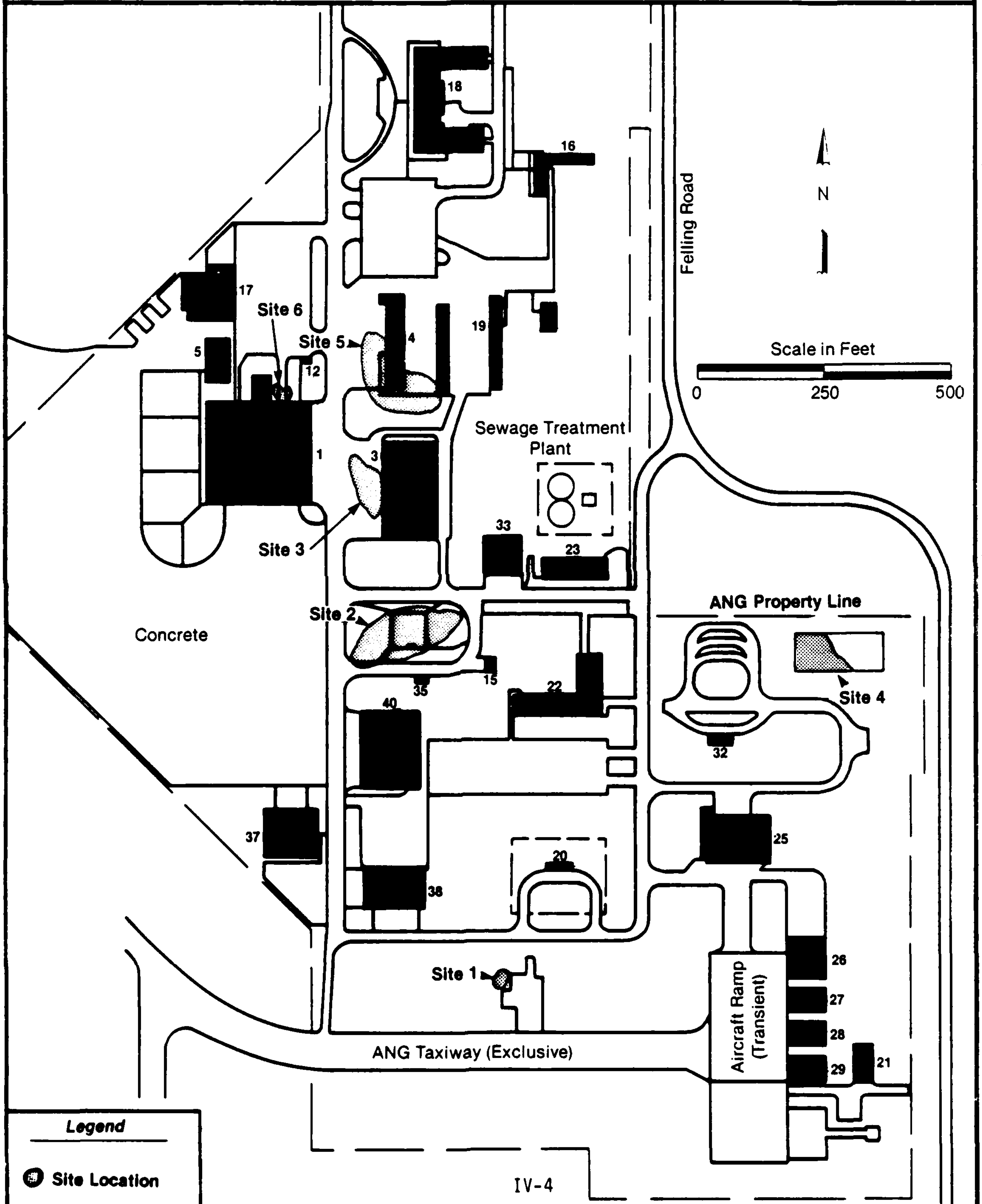


Table 2. Site Hazard Assessment Scores (as derived from HARM): Indiana ANG, Hulman Field, Terre Haute, Indiana

Site Priority	Site No.	Site Description	Receptors	Waste Characteristics	Pathway	Waste Mgmt. Practices	Overall Score
1	5	Vehicle Maintenance Building	58	50	61	1.00	56
2	1	Power Suppressor Pad	58	50	61	0.95	53
3	2	POL Fill Stand	58	50	61	0.95	53
4	4	Old Bladder Area	58	50	61	0.95	53

covered waste is available. Because the amount of waste sorbed by the ground is unknown and a shallow water table underlies the site, a HAS was necessary.

Site No. 2 - Petroleum, Oil, and Lubricant (POL) Fill Stand (HAS-57)

This site, located south of Building No. 3, is a storage and transfer area for POL products. In the winter of 1979, about 5,000 gallons of JP-4 leaked onto the frozen ground at this site. All the JP-4 was reportedly recovered. In June 1985, an error in recording fuel deliveries resulted in overfilling a storage tank containing JP-4 fuel. Approximately 400 gallons spilled and spread across an asphalt paved lot and onto a grassy area. As the spill area and associated storm sewers and ditches were bermed, approximately 100 gallons of fuel was recovered. There have also been other JP-4 spills at the site over the years. Spill control and cleanup measures during these incidents were minimal at best; therefore, a HAS was necessary.

Site No. 3 - Base Supply Warehouse (Unscored)

In 1980, a gasoline leak occurred on the west side of Building No. 3. The gasoline leaked onto pavement and was contained almost immediately. Very little fuel was lost, and the affected pavement area and underlying soil were removed during cleanup. According to interviewees, soil samples collected in the area after the cleanup showed no detectable contamination. Since the spill was quickly cleaned up, and soil samples showed no evidence of any remaining contamination, this site was not assigned a HAS.

Site No. 4 - Old Bladder Area (HAS-53)

This site, which is known as the Pillow Farm or the Old Bladder Area, consists of a flat, grassy parcel of land with dimensions of 160 feet by 80 feet. This area, which was constructed in 1963 or 1964 to enclose five 50,000-gallon JP-4 storage bladders, is surrounded by an earthen dike that is about 2 feet high. These bladders provided a ready source of fuel for the aircraft housed within the alert barns located at the southeast corner of the Base. In 1967 or 1968, the fuel bladders were removed. No fuel spills were ever reported to have occurred at the Old Bladder Area.

In March 1978, mixed water and fuel was observed in the bottom 4-1/2 feet of an underground 25,000-gallon JP-4 storage tank, located approximately 1/2 block west of the Old Bladder Area. In order to inspect this tank, 10,000 gallons of mixed JP-4 and water were pumped from the tank into the diked area at the Old Bladder Area. Because the ground surface within the dike is not level, ponding of the mixture occurred within the southwest corner. This mixture remained within the diked area for approximately 48 hours until a licensed hazardous waste disposal firm arrived and skimmed the floating JP-4 off the water within the dike and disposed of it offsite.

Based on observations of the mixed liquid within the diked area, it is estimated that 2,500 gallons was water and 7,500 gallons was JP-4. Assuming that 90 percent of the JP-4 was recovered, 750 gallons may have percolated into the underlying soil. Because of the potential for contamination and migration of the JP-4 through shallow groundwater, a HAS was necessary.

Site No. 5 - Vehicle Maintenance Building (HAS-60)

This site is located at the north end of the installation. Although there was no visible indication of any HM/HW spills occurring at this site, it was reported during the interview process that various amounts of HM/HW were dumped in an area adjacent to this building. Routine maintenance activities and associated clean-up resulted in small quantities (usually less than one quart) of waste oils, paint thinners and solvents, occasionally being disposed of in this area. This method of disposal was stopped in 1975. Since the dumped materials (probably less than 1,000 gallons) could include environmentally persistent compounds and affect groundwater quality, a HAS was considered necessary.

Site No. 6 - Hangar Building (Unscored)

This site is located on the west side of the Base near the Firehouse and adjacent to the aircraft parking apron. Until 1980, most of the hazardous wastes generated by the Base was stored at this site. These wastes were then collected by a local contractor. Interviewees reported no HM/HW spills in this

area. The site inspection revealed no observable environmental stress. For these reasons, the site was not assigned a HAS.

V. CONCLUSIONS

- Information obtained through interviews with 17 Base personnel, review of Base records, and field observations have resulted in the identification of six disposal/spill sites on the Base. Four of the six sites are potentially contaminated with HM/HW and have been assigned a HAS using HARM.

- A potential for groundwater contamination from surficial sources exists at the Base because the water table is shallow (10 to 20 feet below land surface) and the area is relatively flat and poorly drained. The nearest possible receptor of potential contaminants is a residence 0.5 miles away.

VI. RECOMMENDATIONS

There is a potential for contaminant migration at the Base; therefore, initial stages of the IRP SI/RI/FS are recommended. The purpose of further IRP work is to confirm or refute the presence of contamination at the sites. If confirmation is made, subsequent investigative efforts should be accomplished in order to fully characterize the extent of any soil and groundwater contamination.

<u>Site No. 1 - Power Suppressor Pad</u>

Further IRP analysis is required at this site to determine if contamination exists.

<u>Site No. 2 - POL Fill Stand</u>

Further IRP analysis is required at this site to determine if contamination exists.

<u>Site No. 3 - Base Supply Warehouse</u>

No further IRP work is required at this site.

<u>Site No. 4 - Old Bladder Area</u>

Pending construction at the Old Bladder Area, a remedial action study was performed by HMTC. This study concluded that the proposed construction would effectively cap the site, preventing any leachate from forming and migrating away from the site. A monitoring well was also recommended in the study, to confirm the effectiveness of the "capping" procedure. Following these remedial actions, no further IRP work is recommended.

Site No. 5 - Vehicle Maintenance Building

Further IRP analysis is required at this site to determine if contamination exists.

Site No. 6 - Hangar Building

No further IRP work is required at this site.

GLOSSARY OF TERMS

AQUICLUDE - A confining bed that prevents the flow of water to or from an adjacent aquifer.

AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of groundwater to wells and springs.

AQUITARD - A confining bed that retards but does not prevent the flow of water to or from an adjacent aquifer.

CONE OF DEPRESSION - A depression of the water table or potentiometric surface surrounding a discharge well which is more or less the shape of an inverted cone.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act of 1986 (SARA) shall include, but not be limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress),

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquefied natural gas, or synthetic gas of pipeline quality (or mixtures of natural gas and such synthetic gas).

CRITICAL HABITAT - The native environment of an animal or plant which, due either to the uniqueness of the organism or the sensitivity of the environment, is susceptible to adverse reactions in response to environmental changes such as may be induced by chemical contaminants.

DISCHARGE - The release of any waste stream or any constituent thereof to the environment which is not recovered.

DOWNGRADIENT - A direction that is topographically or hydraulically downslope; the direction in which groundwater flows.

ENDANGERED SPECIES - Wildlife species that are designated as endangered by the U.S. Fish and Wildlife Service.

GROUNDWATER - Refers to the subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981).

HAS - Hazard Assessment Score - The score developed by utilizing the Hazardous Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may

a. cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness or

b. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HYDRAULIC CONDUCTIVITY - The rate at which water can move through a permeable medium.

HYDRAULIC GRADIENT - The difference in head (elevation of water surface) at two points divided by the distance between these two points.

MIGRATION (Contaminant) - The movement of contaminants through pathways (groundwater, surface water, soil, and air).

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

STRATA - Distinguishable horizontal rock layers separated vertically from other layers.

SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.

THREATENED SPECIES - Wildlife species that are designated as threatened by the U.S. Fish and Wildlife Service.

UPGRADIENT - A direction that is topographically or hydraulically upslope.

WATER TABLE - The upper limit of the portion of the ground that is wholly saturated with water.

WETLANDS - Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

WILDERNESS AREA - An area unaffected by anthropogenic activities and deemed worthy of special attention to maintain its natural condition.

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2. Federal Register (FR 31224), 16 July 1982.

3. Federal Register (FR 31235), 16 July 1982.

4. Fetter, C.W., Jr., 1980. Applied Hydrogeology, Charles E. Merrill Publishing Company, Columbus, OH, 488 pp.

5. Hartke, E. J., Hailer, J. G., and Fraser, G.S., 1983. Environmental Geology of Vigo County, Indiana - An Aid to Planning. Indiana Department of Natural Resources, Geological Survey Report 31, 58 pp.

6. McGowen, Michael, Capt., Spill Prevention Control and Containment Plan, Indiana Air National Guard, 1984.

7. Montgomery, Robert H., 1974. Soil Survey of Vigo County, Indiana, United States Department of Agriculture, Soil Conservation Service, 121 pp.

Appendix A
Resumes of HMTC Seach Team Members

TIMOTHY N. GARDNER

Environmental Scientist

EDUCATION

M.A., Environmental Biology, Hood College
B.S., Forestry/Resource Management, West Virginia University

EXPERIENCE

Mr. Gardner has five years of technical experience in environmental control and research, with emphasis on risk assessment, chemical safety, radiation safety, hazardous waste management (chemical and radiologic), and activated carbon filtration research. His past responsibilities include site risk assessment, chemical and radioactive waste pickup and storage for disposal at a large cancer research facility, and chemical and radioactive spill control, as well as safety surveys and technical assistance in activated carbon desorption research.

EMPLOYMENT

Dynamac Corporation (1984-Present): Staff Scientist

At Dynamac, Mr. Gardner's responsibilities include site surveys and record searches for the Phase I portion of the Installation Restoration Program (IRP) for various Air National Guard Bases. Efforts include risk assessment, site prioritization, and remedial action recommendations. He has also been a contributing author for a closure-post closure plan for a hazardous waste landfill at Clovis AFB, plans and specifications for the removal of asbestos at several Air Force White Alice sites in Alaska, and the update and revision of a DLA regulation for "Disposal of Unwanted Radioactive Material."

NCI-Frederick Cancer Research Facility (1981-1984): Lab Technician

Mr. Gardner worked in radiation and chemical safety as well as environmental research. His responsibilities included monitoring personal and environmental air quality at work areas where free iodinations occurred, monitoring work areas and equipment for isotope contamination, periodic surveys to monitor compliance with NCR safety regulations, isotope inventory control, transfer of isotopes between licenses, and periodic calibration and maintenance of survey instruments. He was also responsible for radioactive and chemical waste pickup and storage for disposal, and served as an advisor for safety-related matters pertinent to radiation and radioactive waste, chemical safety, and industrial hygiene. In the environmental research division, he was s involved in activated carbon desorption studies involving the use of analytic laboratory equipment.

PROFESSIONAL AFFILIATIONS

American Tree Farm Association
Hardwood Research Council
West Virginia Forestry Association

ROBERT J. PAQUETTE

EDUCATION

B.S., environmental science, University of New Hampshire, 1973

EXPERIENCE

Extensive experience in hazardous waste receiving, handling, storage, and property accounting. Designed a system of labeling hazardous material/waste for proper storage. Developed Part B Application Information for many hazardous waste facilities. Conducted training sessions in hazardous materials/waste including receiving/warehousing, storage compatibility and personal safety. Performed atmospheric sampling for all major pollutants, computer modeling research projects and surveillance of possible regional air pollution sources.

EMPLOYMENT

Dynamac Corporation (1984-present): Environmental Scientist

Presently working on Installation Restoration Program for Air National Guard. Also, wrote State-of-the-Art Procedures for Defense Supply Depots concerning compatibility, Packing, Packaging, Spill Response, and Recoupment of hazardous materials and waste.

Defense Reutilization and Marketing Region, Defense Depot Ogden (1981-1984): Environmental Protection Specialist

Provided daily property disposal guidance to DPDOs concerning receiving, handling, storage and property accounting of HM/HW; provided technical advice on the handling and disposal of HM/HW to field personnel at DPDOs in region. Interpreted State and Federal regulations for superiors and the DPDOs, and acted as liaison between field personnel and State/Federal environmentalists. Assisted in rewriting DOD environmental regulations. Trained DPDO personnel in all aspects of HM/HW procedures as part of their increasingly involved environmental mission; wrote Emergency Response and Spill Contingency Plans. Developed Part B applications for HW facilities. Conducted environmental audits at DPDOs and other D.O.D. facilities.

State of New Hampshire, Bureau of Solid Waste Management (1979-1981): Environmental Specialist

Responsible for all work activities dealing with uncontrolled hazardous waste sites. Working knowledge of safety equipment, personal protection equipment, safety plans, and monitoring, sampling and analytical procedures relating to hazardous waste. Daily contact with industry and the general public discussing current New Hampshire and Federal hazardous waste regulations. Assisted in developing regulations and interpreting existing regulations. Conducted research regarding proper disposal of hazardous waste materials; determining if certain materials are considered hazardous. Conducted inspections of industry to insure compliance with the Federal hazardous waste regulations (RCRA). Daily interaction with the U.S. Environmental Protection Agency.

State of New Hampshire, Air Resource Agency (1978-1979): Environmental Specialist

Assisted in conducting the research for and the development of the State Implementation Plan for New Hampshire; conducted computer modeling research projects and was partly responsible for Atmospheric Dispersion Modeling of Meteorology for the State of New Hampshire which included written and verbal reports. Knowledge of N.E.S.H.A.P. and N.H. Air Resource Regulations.

State of New Hampshire, Air Resource Agency (1974-1978): Air Pollution Technician

Responsible for atmospheric sampling for all major pollutants; site determination and development maintenance of air pollution monitors; air pollution monitoring and meteorology; chart data reduction; written reports; surveillance of all possible air pollution sources in district; inspections of most industries in district; constant public contact with county and city officials as well as the general populace; complaint investigations; occasional dissertations to private and public organizations.

JANET S. EMRY

EDUCATION

M.S., geology, Old Dominion University, 1987
B.S., (cum laude), geology, James Madison University, 1983

EXPERIENCE

One year of technical experience in the fields of hydrogeology and environmental science. Experience includes the drilling and placement of wells, well monitoring, aquifer testing and determination of hydraulic properties, computer modeling of aquifer systems, field and laboratory soils analysis.

EMPLOYMENT

Dynamac Corporation (1987-present): Staff Scientist/Hydrogeologist

Responsible for providing geological and groundwater assessments of possible hazardous waste disposal/spill sites, including the determination of rates and extents of contaminant migration and computer modeling of groundwater flow and contaminant transport.

Froehling and Robertson, Inc. (1986-1987): Geologist/Engineering Technician

Performed both field and laboratory engineering soils tests.

The Nature Conservancy (1985-1986): Hydrogeologist

Investigated groundwater geology of the Nature Conservancy's Nags Head Woods Ecological Preserve in Dane County, North Carolina. Study included installing wells, monitoring water table levels, determination of hydraulic parameters through a pumping test, stratigraphic test borings, and computer modeling.

Old Dominion University (1983-1985): Teaching Assistant, Department of Geological Sciences

Taught laboratory classes in Earth Science and Historical Geology.

PROFESSIONAL AFFILIATIONS

Geological Society of America
National Water Well Association

PUBLICATION

Impact of Municipal Pumpage upon a Barrier Island Water Table, Nags Head and Kill Devil Hills, North Carolina. In: Abstracts with Programs, Geological Society of America, Vol. 19, No. 2, February 1987.

MARK D. JOHNSON

EDUCATION

B.S., geology, James Madison University, 1980

EXPERIENCE

Seven years' technical experience including geologic mapping, subsurface investigations, foundation inspections, groundwater monitoring, pumping and observation well installation, geotechnical instrumentation, groundwater assessment, preparation of Air Force Installation Restoration Program Guidance and preparation of statements of work for the Air Force and the Air National Guard.

EMPLOYMENT

Dynamac Corporation (1984-present): Staff Scientist/Geologist

Primarily responsible for preparing statements of work for Phase IV-A of the Air Force's Installation Restoration Program, statements of work for Phase II and Phase IV-A of the Air National Guard's Installation Restoration Program, and assessing groundwater of hazardous waste disposal/spill sites on military installations for the purpose of determining rates and extents of contaminant migration and for developing site investigations, remedial investigations and identifying remedial actions. Prepared management guidance document for the Air Force's Installation Restoration Program.

Bechtel Associates Professional Corporation (1981-1984): Geologist

Performed the following duties in conjunction with major civil engineering projects including subways, nuclear power plants and buildings: prepared geologic maps of surface and subsurface facilities in rock and soil including tunnels, foundations and vaults; assessed groundwater conditions in connection with construction activities and groundwater control systems; monitored the installation of permanent and temporary dewatering systems and observation wells; monitored surface and subsurface settlement of tunnels; and participated in subsurface investigations.

Schnabel Engineering Associates (1981): Geologist

Inspected foundations and backfill placement.

PROFESSIONAL AFFILIATIONS

Association of Engineering Geologists
National Water Well Association/Association of Ground Water Scientists and Engineers
British Tunneling Society

RAYMOND G. CLARK, JR.

EDUCATION

Completed graduate engineering courses, George Washington University, 1957
B.S., mechanical engineering, University of Maryland, 1949

SPECIALIZED TRAINING

Grad. European Command Military Assistance School, Stuttgart, 1969
Grad. Army Psychological Warfare School, Fort Bragg, 1963
Grad. Sanz School of Languages, D.C., 1963
Grad. DOD Military Assistance Institute, Arlington, 1963
Grad. Defense Procurement Management Course, Fort Lee, 1960
Grad. Engineer Officer's Advanced Course, Fort Belvoir, 1958

CERTIFICATIONS

Registered Professional Engineer: Kentucky (#4341); Virginia (#8303); Florida (#36228)

EXPERIENCE

Twenty-nine years of experience in engineering design, planning and management including construction and construction management, environmental, operations and maintenance, repair and utilities, research and development, electrical, mechanical, master planning and city management. Over six years' logistical experience including planning and programming of military assistance materiel and training for foreign countries, serving as liaison with American private industry, and directing materiel storage activities in an overseas area. Over two years' experience as an engineering instructor. Extensive experience in personnel management, cost reduction programs, and systems improvement.

EMPLOYMENT

Dynamac Corporation (1986-present): Program Manager

Responsible for activities relating to Phases I, II and IV of the U.S. Air Force Installation Restoration Program including records search, review and evaluation of previous studies; preparation of statements of work, feasibility studies; preparation of remedial action plans, designs and specifications; review of said studies/plans to ensure that they are in conformance with requirements; review of environmental studies and reports; and preparation of Air Force Installation Restoration Program Management Guidance.

Howard Needles Tammen & Bergendoff (HNTB) (1981-1986): Manager

Responsible, as Project Manager, for: design of a new concourse complex at Miami International Airport to include terminal building, roadway system, aircraft apron, drainage channel relocation, satellite building with underground pedestrian tunnel, and associated underground utility corridors, to include subsurface aircraft fueling systems, with an estimated construction cost of $163 million; a cargo vehicle tunnel under the crosswind runway with an estimated construction cost of $15 million; design and construction of two large corporate jet aircraft hangars; and for the hydrocarbon recovery program to include investigation, analysis, design of recovery systems, monitoring of recovery systems, and planning and design of residual recovery systems utilizing biodegradation. Participated, as sub-consultant, in Air Force IRP seminar.

HNTB (1979-1981): Airport Engineer

Responsibilities included development of master plan for Iowa Air National Guard base; project initiation assistance for a new regional airport in Florida; engineering assistance for new facilities design and construction for Maryland Air National Guard; master plan for city maintenance facilities, Orlando, Florida; in-country master plan and preliminary engineering project management for Madrid, Spain, International Airport; and project management of master plan for Whiting Naval Air Station and outlying fields in Florida.

HNTB (1974-1979): Design Engineer

Responsibilities included development of feasibility and site selection studies for reliever airports in Cleveland and Atlanta; site selection and facilities requirements for the Office of Aeronautical Charting and Cartography, NOAA; and onsite mechanical and electrical engineering design for terminal improvements at Baltimore-Washington International Airport, Maryland.

HNTB (1972-1974): Airport Engineer

Responsible for development of portions of the master plan and preliminary engineering for a new international airport for Lisbon, Portugal, estimated to cost $250 million.

Self-employed (1971-1972): Private Consultant

Responsible for engineering planning and installation of a production line for multimillion-dollar contract in Madrid, Spain, to fabricate transmissions and differentials for U.S. Army vehicles.

U.S. Army, Corps of Engineers (1969-1971): Chief, Materiel & Programs

Directed materiel planning and military training programs of military assistance to the Spanish Army. Controlled arrival and acceptance of materiel by host government. Served as liaison/advisor to American industry interested

in conducting business with Spanish government. Was Engineer Advisor to Spanish Army Construction, Armament and Combat Engineers, also the Engineer Academy and Engineer School of Application.

Corps of Engineers (1968-1969): Chief, R&D Branch, OCE

Directed office responsible to Chief of Engineers for research and development. Developed research studies in new concepts of bridging, new explosives, family of construction equipment, night vision equipment, expedient airfield surfacing, expedient aircraft fueling systems, water purification equipment and policies, prefabricated buildings, etc. Achieved Department of Army acceptance for development and testing of new floating bridge. Participated in high-level Department Committee charged with development of a Tactical Gap Crossing Capability Model.

Corps of Engineers (1967-1968): Division Engineer

Facilities engineer in Korea. Was fully responsible for management and maintenance of 96 compounds within 245 square miles including 6,000+ buildings, 1 million linear feet of electrical distribution lines, 18 water purification and distribution systems, sanitary sewage disposal systems, roads, bridges, and fire protection facilities with real property value of more than $256 million. Planned and developed the first five-year master plan for this area. Administered $12 million budget and $2 million engineer supply operation. Was in responsible charge of over 500 persons. Developed and obtained approval for additional projects worth $9 million for essential maintenance and repair. Directed cost reduction programs that produced more than $500,000 savings to the United States in the first year.

Corps of Engineers (1963-1967): Engineer Advisor

Engineer and aviation advisor to the Spanish Army. Developed major modernization program for Spanish Army Engineers, including programming of modern engineer and mobile maintenance equipment. Directed U.S. portion of construction, testing and acceptance of six powder plants, one shell loading facility, an Engineer School of Application, and depot rebuild facilities for engineer, artillery, and armor equipment. Planned and developed organization of a helicopter battalion for the Spanish Army. Responsible for sales, delivery, assembly and testing of 12 new helicopters in country. Provided U.S. assistance to unit until self-sufficiency was achieved. Was U.S. advisor to Engineer Academy, School of Application and Polytechnic Institute.

Corps of Engineers (1960-1963): Deputy District Engineer

Responsible for planning and development of extensive construction projects in the Ohio River Basin for flood control and canalization, including dam, lock, bridge, and building construction, highway relocation, watershed studies, real estate acquisitions and dispositions. Was contracting officer for more than $75

million of projects per year. Supervised approximately 1,300 personnel, including 300 engineers. Planned and directed cost reduction programs amounting to more than $200,000 per year. Programmed and controlled development of a modern radio and control net in a four-state area.

Corps of Engineers (1959-1960): Area Engineer

Directed construction of a large airfield in Ohio as Contracting Officer's representative. Assured that all construction (runway, steam power plant, fuel transfer and loading facilities, utilities, buildings, etc.) complied with terms of plans and specifications. Was onsite liaison between Air Force and contractors.

Corps of Engineers (1958-1959): Chief, Supply Branch

Managed engineer supply yard containing over $21 million construction supplies and engineer equipment. Directed in-storage maintenance, processing and deprocessing of equipment. Achieved complete survey of items on hand, a new locator system and complete rewarehousing, resulting in approximately $159,000 savings in the first year.

Corps of Engineers (1957-1958): Student

U.S. Army Engineer School, Engineer Officer's Advanced Course.

Corps of Engineers (1954-1957): Engineer Manager

Managed engineer construction projects and was assigned to staff and faculty of the Engineer School. Was in charge of instruction on engineer equipment utilization, management and maintenance. Directed Electronic Section of the school. Coordinated preparation of five-year master plan for the Department of Mechanical and Technical Equipment.

Corps of Engineers (1949-1954): Engineer Commander

Positions of minor but increasing importance and responsibility in engineering management, communications, demolitions, construction administration and logistics.

PROFESSIONAL AFFILIATIONS

Member, National Society of Professional Engineers
Fellow, Society of American Military Engineers
Member, American Society of Civil Engineers
Member, Virginia Engineering Society
Member, Project Management Institute

HARDWARE

IBM PC

SOFTWARE

Lotus 1-2-3, D Base III Plus, Framework, Project Scheduler 5000, Harvard Project Manager, Volkswriter, Microsoft Project

Appendix B
Interviewee Information

INTERVIEWEE INFORMATION

Interviewee Number	Primary Duty Assignment	Years Associated with Indiana ANG
1	Civil Engineering	30
2	Civil Engineering	14
3	Operations and Maintenance	33
4	Supply Operations	33
5	Bioenvironmental Engineering	3
6	Production Control Operations	13
7	POL Operations	33
8	POL Operations	11
9	AGE Operations	8
10	Automotive Maintenance	26
11	Civil Engineering	29
12	Civil Engineering	9
13	Civil Engineering	2
14	Engineering Maintenance	30
15	Engineering Maintenance	18
16	Engineering Administration	13
17	Supply Management	32

Appendix C
Outside Agency Contact List

OUTSIDE AGENCY CONTACT LIST

Environmental Service Group
520 Virginia Avenue
Indianapolis, Indiana 46203

Federal Emergency Management Agency
Flood Map Distribution Center
6930 (A-F) San Tomas Road
Baltimore, Maryland 21227-6227

Indiana Department of Natural Resources
Division of Fish and Wildlife
607 State Office Building
Indianapolis, Indiana 46204

Indiana State University
Department of Geography and Geology
Terre Haute, Indiana 47809

United States Geological Survey
12201 Sunrise Valley Drive
Reston, Virginia 22092

Appendix D
USAF Hazard Assessment Rating Methodology

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The Department of Defense (DoD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DoD facilities. One of the actions required under this program is to:

> develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air National Guard in setting priorities for follow-on site investigations.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD program needs.

The model uses data readily obtained during the Records Search portion (Phase I) of the IRP. Scoring judgment and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1 of this report). The site rating form and the rating factor guideline are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: possible receptors of the contamination, the waste and its characteristics, the potential pathways for contamination migration, and any efforts that were made to contain the wastes resulting from a spill.

The receptors category rating is based on four rating factors: the potential for human exposure to the site, the potential for human ingestion of contaminants should underlying aquifers be polluted, the current and anticipated uses of the surrounding area, and the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1,000 feet of the site, and the distance between the site and the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for

adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 x factor score subtotal/maximum score subtotal).

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways: surface-water migration, flooding, and groundwater migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned, and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no containment are not reduced. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factory to the sum of the scores for the other three categories.

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ____________________

LOCATION ____________________

DATE OF OPERATION OR OCCURRENCE ____________________

OWNER/OPERATOR ____________________

COMMENTS/DESCRIPTION ____________________

SITE RATED BY ____________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to installation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	____	____

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ____

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ____
2. Confidence level (C - confirmed, S - suspected) ____
3. Hazard rating (H - high, M - medium, L - low) ____

Factor Subscore A (from 20 to 100 based on factor score matrix) ____

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

____ X ____ = ____

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

____ X ____ = ____

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
Subtotals			______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 X factor score/3) ______

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
Subtotals			______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ☐

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

1. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-15	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records
- o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

II. WASTE CHARACTERISTICS--Continued

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	M
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level
- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating
- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($>10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall	<1.0 inch	1.0 to 2.0 inches	2.1 to 3.0 inches	>3.0 inches	8
(Thunderstorms)	0-5 0	6-35 30	36-49 60	>50 100	

B-2 Potential for Flooding

Rating Factors	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Ground-Water Contamination

Rating Factors	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to + 20 inches	Greater than +20 inches	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8

B-3 Potential for Ground-Water Contamination--Continued

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1, or III-6-3, then leave blank for calculation of factor score and maximum possible score.

CNR122

Appendix E
Site Hazardous Assessment Rating Forms

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 1 - Power Suppressor Pad

LOCATION Indiana Air National Guard, Hulman Field, Terre Haute, Indiana

DATE OF OPERATION OR OCCURRENCE 17 January 1986

OWNER/OPERATOR 181st Tactical Fighter Group, Indiana Air National Guard

COMMENTS/DESCRIPTION 250 Gallon Waste Oil Spill - South end of ANGI

SITE RATED BY Hazardous Materials Technical Center HMTC

1. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	104	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

50 x 1.0 = 50

HAZARDOUS ASSESSMENT RATING FORM

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
Subtotals			66	108

Subscore (100 X factor score subtotal/maximum score subtotal) 61

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	1	1	1	3

Subscore (100 X factor score/3) 33

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114

Subscore (100 X factor score subtotal/maximum score subtotal) 33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	58
Waste Characteristics	50
Pathways	61
Total 169 divided by 3 =	56 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

56 x 0.95 = 53

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 2 - POL Fill Stand

LOCATION Indiana Air National Guard, Hulman Field, Terre Haute, Indiana

DATE OF OPERATION OR OCCURRENCE 11 June 1985

OWNER/OPERATOR 181st Tactical Fighter Group, Indiana Air National Guard

COMMENTS/DESCRIPTION 400 Gallon JP-4 Spill - Adjacent to building #6

SITE RATED BY Hazardous Materials Technical Center

1. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	104	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

50 x 1.0 = 50

HAZARDOUS ASSESSMENT RATING FORM

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
Subtotals			66	108

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	1	1	1	3

Subscore (100 X factor score/3) 33

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114

Subscore (100 X factor score subtotal/maximum score subtotal) 33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors 58
Waste Characteristics 50
Pathways 61
Total 169 divided by 3 = 56
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

56 x 0.95 = $\boxed{53}$

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Site No. 5 - Vehicle Maintenance Building

LOCATION Indiana Air National Guard, Hulman Field, Terre Haute, Indiana

DATE OF OPERATION OR OCCURRENCE Various Prior to 1975

OWNER/OPERATOR 181st Tactical Fighter Group, Indiana Air National Guard

COMMENTS/DESCRIPTION Various amounts of oils, paint thinners, and solvents

SITE RATED BY Hazardous Materials Technical Center

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
Subtotals			104	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 58

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

50 x 1.0 = 50

HAZARDOUS ASSESSMENT RATING FORM

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
Subtotals			66	108

Subscore (100 X factor score subtotal/maximum score subtotal) 61

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	1	1	1	3

Subscore (100 X factor score/3) 33

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
Subtotals			38	114

Subscore (100 X factor score subtotal/maximum score subtotal) 33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	58
Waste Characteristics	50
Pathways	61

Total 169 divided by 3 = 56 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

56 X 1.0 = 56

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE Old Bladder Area (OBA)

LOCATION Indiana Air National Guard, Hulman Field, Terre Haute, Indiana

DATE OF OPERATION OR OCCURRENCE 1978

OWNER/OPERATOR 181st Tactical Fighter Group, Indiana Air National Guard

COMMENTS/DESCRIPTION Mixed JP-4 and Water stored in diked area for 48 hrs.

SITE RATED BY HMTC

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	2	4	8	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1 mile radius	2	3	6	9
D. Distance to installation boundary	3	6	18	18
E. Critical environments within 1 mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	2	9	18	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground-water supply within 3 miles of site	3	6	18	18
		Subtotals	104	180

Receptors subscore (100 X factor score subtotal/maximum score subtotal) 53

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C - confirmed, S - suspected) C
3. Hazard rating (H - high, M - medium, L - low) M

Factor Subscore A (from 20 to 100 based on factor score matrix) 50

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B
50 x 1.0 = 50

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore
50 x 1.0 = 50

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore 0

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water	3	8	24	24
Net precipitation	1	6	6	18
Surface erosion	1	8	8	24
Surface permeability	2	6	12	18
Rainfall intensity	2	8	16	24
		Subtotals	66	108

Subscore (100 X factor score subtotal/maximum score subtotal) 61

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding	1	1	1	3

Subscore (100 X factor score/3) 33

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water	2	8	16	24
Net precipitation	1	6	6	18
Soil permeability	1	8	8	24
Subsurface flows	0	8	0	24
Direct access to ground water	1	8	8	24
		Subtotals	38	114

Subscore (100 X factor score subtotal/maximum score subtotal) 33

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore 61

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	58
Waste Characteristics	50
Pathways	61

Total 169 divided by 3 = 56 Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

56 x 0.95 = $\boxed{53}$

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